

New claims (Annex 10 IPER)

1. Lifting mechanism (100) with a hydraulic control and adjustment system and a working tool (6) in a mobile machine with at least a first and second lifting cylinder (61, 62), in which cylinder pistons (63, 65) are displaceable, the position or direction of movement of which in the lifting cylinders (61, 62) fix the lifting height or the vertical direction of movement of the working tool (6) relative to a vehicle body (4) of the mobile machine, wherein each of the cylinder pistons (63, 65) divides the associated lifting cylinder (61, 62) into two adjusting pressure chambers (67 and 68, 69 and 70) in each case and with a first hydraulic pump (75), adjustable in respect of the discharge volume, the first connection (74) of which is connected depending on the vertical direction of movement of the working tool (6) to one of the adjusting pressure chambers (67) of the first lifting cylinder (61) and one of the adjusting pressure chambers (69) of the second lifting cylinder (62) and the second connection (77) of which is connected in a closed circuit to the other adjusting pressure chamber (68) of the first lifting cylinder (61) and the other adjusting pressure chamber (70) of the second lifting cylinder (62),
- characterised in that**
- a piston side adjusting pressure chamber (67) of the first lifting cylinder (61) is connected to a piston rod side adjusting pressure chamber (69) of the second lifting cylinder (62) via a first hydraulic line (71) and a piston rod side adjusting pressure chamber (68) of the first lifting cylinder (61) is connected to a

piston side adjusting pressure chamber (70) of the second lifting cylinder (62) via a second hydraulic line (72) and the first lifting cylinder (61) and the adjusting piston (65, 143) of the second lifting cylinder (62) are connected to a boom (64) connecting the working tool (6) to the vehicle body (4) of the mobile machine and the second lifting cylinder (62) and the adjusting piston (63, 142) of the first lifting cylinder (61) are connected to the body (4) of the mobile machine.

2. Lifting mechanism according to claim 1, **characterised in that** in each case a first adjusting pressure chamber (68; 69) borders on the associated cylinder piston (63; 65) with a pressurisation face (A1) which is smaller than the pressurisation face (A2) with which the other second adjusting pressure chamber (67; 70) in each case borders on the corresponding cylinder piston (63; 65) and in that each connection (74; 77) of the hydraulic pump (75) is connected to a first adjusting pressure chamber (68; 69) with a smaller pressurisation face (A1) and a second adjusting pressure chamber (70; 67) with a larger pressurisation face (A2).

3. Lifting mechanism according to claim 1 or 2, **characterised in that** the two boom side adjusting pressure chambers (144, 146) of the first and second lifting cylinders (61, 62) are connected via a first hydraulic line (151) and the two vehicle body side adjusting pressure chambers

(145, 147) of the first and second lifting cylinders (61, 62) via a second hydraulic line (152).

4. Tilting mechanism (200) with a hydraulic control and
5 adjustment system and with a loading shovel (6)
serving as a working tool (6) in a mobile machine with
at least a first and second shovelling cylinder (1,
2), in which cylinder pistons (3, 5) are displaceable,
the position or direction of movement of which in the
10 shovelling cylinders (1, 2) fix the tilting angle or
the tilting direction of the loading shovel (6)
relative to a vehicle body (4), wherein each of the
cylinder pistons (3, 5) divides the associated
shovelling cylinder (1, 2) into two adjusting pressure
15 chambers (7 and 8, 9 and 10) in each case, and with a
second hydraulic pump (15), adjustable in respect of
the discharge volume, the first connection (14) of
which is connected depending on the tilting direction
of the loading shovel (6) to one of the adjusting
20 pressure chambers (7) of the first shovelling
cylinder (1) and one of the adjusting pressure
chambers (10) of the second shovelling cylinder (2)
and the second connection (17) of which is connected
in a closed circuit to the other adjusting pressure
25 chamber (8) of the first shovelling cylinder (1) and
the other adjusting pressure chamber (9) of the second
shovelling cylinder (2),
characterised in that
the piston side adjusting pressure chamber (7) of the
30 first shovelling cylinder (1) is connected to the
piston rod side adjusting pressure chamber (10) of the
second shovelling cylinder (2) via a first hydraulic
line (11) and the piston rod side adjusting pressure

chamber (8) of the first shovelling cylinder (1) is connected to the piston side adjusting pressure chamber (9) of the second shovelling cylinder (2) via a second hydraulic line (12) and the first shovelling cylinder (1) and the adjusting piston (5, 131) of the second shovelling cylinder (2) are connected to the loading shovel (6) and the second shovelling cylinder (2) and the adjusting piston (3, 130) of the first shovelling cylinder (1) are connected to the body (4) of the mobile machine.

5. Tilting mechanism according to claim 4,
characterised in that
 in each case a first adjusting pressure chamber (8; 10) borders on the associated cylinder piston (3; 5) with a pressurisation face (A1) which is smaller than the pressurisation face (A2) with which the other second adjusting pressure chamber (7; 9) in each case borders on the corresponding cylinder piston (3; 5) and in that each connection (14; 17) of the hydraulic pump (15) is connected to a first adjusting pressure chamber (10; 8) with a smaller pressurisation face (A1) and a second adjusting pressure chamber (9; 7) with a larger pressurisation face (A2).

6. Tilting mechanism according to claim 4 or 5,
characterised in that
 the two loading shovel side adjusting pressure chambers (132, 134) of the first and second shovelling cylinders (1, 2) are connected via a first hydraulic line (136) and the two vehicle body side adjusting pressure chambers (133, 135) of the first and second

shovelling cylinders (1, 2) via a second hydraulic line (137).

- 5 7. Lifting and tilting mechanism according to claim 1 and 4,

characterised in that

the discharge direction of the first hydraulic pump (75) operating in two-quadrant operation fixes
10 the vertical direction of movement of the working tool (6) or the discharge direction of the second hydraulic pump (15), likewise operating in two-quadrant operation, fixes the tilting direction of the loading shovel (6).

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8. Lifting and tilting mechanism according to claim 1 and 4,

characterised in that

the discharge volume discharged at the first and
20 second connections (74, 77) of the first hydraulic pump (75) fixes the lifting height of the working tool (6) or the discharge volume discharged at the first and second connection (14, 17) of the second hydraulic pump (15) fixes the tilting angle of the loading
25 shovel (6).

9. Lifting and tilting mechanism according to claim 8,
characterised in that
the adjustment of the discharging device of the second
30 hydraulic pump (15) and the discharge volume discharged at the first and second connections (14, 17) of the second hydraulic pump (15) is done as a function of a deflection set on a steering

instrument (52) constructed in the manner of a joystick in a first deflection dimension and the setting of the direction of rotation of the first hydraulic pump (75) and the adjusting pressure built up at the first and second connections (74, 77) of the first hydraulic pump (75) is done as a function of a deflection set on the steering instrument (52) constructed in the manner of a joystick in a second deflection dimension.

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10. Lifting and tilting mechanism according to claim 9, **characterised in that**

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a first adjusting valve (41) is actuated as a function of the deflection of the steering instrument (52) in the first deflection dimension and a second adjusting valve (102) is actuated as a function of the deflection of the steering instrument (52) in the second deflection dimension.

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11. Lifting and tilting mechanism according to claim 10, **characterised in that**

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the deflection of the first adjusting valve (41) is done by electric adjusting magnets on control connections (49, 50) of the first adjusting valve (41), wherein one control connection (49) receives a first electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the first deflection dimension, corresponding to the tilting inwards movement, and the other control connection (50) receives a second electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the first deflection dimension, corresponding to the tilting

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outwards movement, from a transformer of the steering instrument (52) and in that the deflection of the second adjusting valve (102) is done by electric adjusting magnets at control connections (110, 111) of the second adjusting valve (102), wherein one control connection (110) receives a third electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the second deflection dimension, corresponding to the lifting movement, and the other control connection (111) receives a fourth electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the second deflection dimension, corresponding to the lowering movement, from a transformer of the steering instrument (52).

12. Lifting and tilting mechanism according to claim 10, **characterised in that**
- the deflection of the first adjusting valve (41) is done by adjusting pressures generated by a pilot control device (130) from the deflection of the steering instrument (52) in the first deflection dimension and supplied to control chambers located at the two control connections (49, 50) of the first adjusting valve (42) and the deflection of the second adjusting valve (102) is done by adjusting pressures generated by the pilot control device (130) from the deflection of the steering instrument (52) in the second deflection dimension and supplied to control chambers located at the two control connections (110, 111) of the second adjusting valve (102).

13. Lifting and tilting mechanism according to claim 12,
characterised in that
via a first pair of pressure reducing valves (143)
consisting of two pressure reducing valves (139, 140),
5 the inputs of which are connected in each case to a
high pressure side connection (24) of a first feed
pump (19), and a hydraulic tank (138) which generates
adjusting pressures corresponding to the deflection of
the steering instrument (52) in the two directions of
10 the first deflection dimension, the pilot control
device (130) generates corresponding adjusting
pressures for actuating the first adjusting valve (42)
and via a second pair of pressure reducing
valves (144), consisting of two pressure reducing
15 valves (141, 142), the inputs of which are connected
in each case to a high pressure side connection (24)
of a first feed pump (19) and a first hydraulic
tank (138) which generates adjusting pressures
corresponding to the deflection of the steering
20 instrument (52) in the two directions of the second
deflection dimension for the second adjusting
valve (102).
14. Lifting and tilting mechanism according to one of
25 claims 10 to 13,
characterised in that
the first and second adjusting valve (41, 102) is in
each case a 4/3 port directional control valve,
wherein the first input connection (44, 105) of the
30 first adjusting valve (41) is connected to the high
pressure side connection (24) of the first feed
pump (19), the first input connection (105) of the
second adjusting valve (102) is connected to a high

pressure side connection (84) of a second feed pump (79), the second input connection (46, 107) of the first and second adjusting valves (41, 102) is connected in each case to a hydraulic tank (48, 109),
 5 the first output connection (40) of the first adjusting valve (41) is connected to a first adjusting pressure chamber (37) of a first adjusting device (35), the first output connection (101) of the second adjusting valve (102) is connected to a first
 10 adjusting pressure chamber (97) of a second adjusting device (95), the second output connection (43) of the first adjusting valve (41) is connected to a second adjusting pressure chamber (38) of a first adjusting device (35) and the second output connection (104) of
 15 the second adjusting valve (102) is connected to a second adjusting pressure chamber (98) of a second adjusting device (95).

15. Lifting and tilting mechanism according to claim 14,
 20 **characterised in that**
 adjustment of the second hydraulic pump (15) in respect of the discharge direction and the discharge volume discharged at the first and second connection (14, 17) is done by the first adjusting device (35)
 25 and adjustment of the first hydraulic pump (75) in respect of the discharge direction and the discharge volume discharged at the first and second connections (74, 77) by the second adjusting device (95).

30 16. Lifting and tilting mechanism according to one of claims 13 to 15,
characterised in that

the second hydraulic pump (15) and the first feed pump (19) or the first hydraulic pump (75) and the second feed pump (79) are driven by a common shaft (18, 78) in each case of a common or in each case separate machine, in particular by a diesel aggregate.

17. Lifting and tilting mechanism according to one of claims 13 to 16,
characterised in that
a low pressure side connection (20) of the first feed pump (19) is connected via a filter (22) to a hydraulic tank (23), a low pressure side connection (80) of the second feed pump (79) via a filter (82) to a hydraulic tank (83), the high pressure side connection (24) of the first feed pump (19) via a check valve (29, 30) in each case to a first hydraulic load line (13) attached to a first connection (14) of the second hydraulic pump (15) and to a second hydraulic load line (16) attached to a second connection (17) of the second hydraulic pump (15) and the high pressure side connection (84) of the second feed pump (79) via a check valve (89, 90) in each case to a third hydraulic load line (73) attached to a first connection (74) of the first hydraulic pump (75) and to a fourth hydraulic load line (76) attached to a second connection (77) of the first hydraulic pump (75).
18. Lifting and tilting mechanism according to claim 17,
characterised in that

a check valve (55, 116) with an opener (58, 129) is provided in the first and third hydraulic load lines (13, 73) in each case.

- 5 19. Lifting and tilting mechanism according to claim 18,
characterised in that,
after transformation into a corresponding pressure,
the second electric adjusting signal actuates an
opener (58) of the check valve (55) integrated in the
10 first hydraulic load line (13) and, after
transformation into a corresponding pressure, the
fourth electric adjusting signal actuates an
opener (129) of the check valve (116) integrated in
the third hydraulic load line (73).
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20. Lifting and tilting mechanism according to claim 17,
characterised in that
the second adjusting pressure generated by the pilot
control device (130) actuates an opener (58) of the
20 check valve (55) integrated in the first hydraulic
load line (13) and the fourth adjusting pressure
generated by the pilot control device (130) actuates
an opener (129) of the check valve (116) integrated in
the third hydraulic load line (73).
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21. Lifting and tilting mechanism according to claim 17,
characterised in that
located between the third and fourth hydraulic load
lines (73, 76) is a 2/2 port directional control
30 valve (119) which opens in the operating state
"floating position" of the boom (64) by applying an
electric signal to an electric adjusting magnet
located at the control input (121) of the 2/2 port

directional control valve (119) or alternately by applying an adjusting pressure in a control chamber located at the control input (121) of the 2/2 port directional control valve (119).

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22. Lifting and tilting mechanism according to claim 17,
characterised in that

10 the third hydraulic load line (73) is connected via a hydraulic line (128) to a hydraulic control arrangement (125) to damp pitching oscillations of the working tool (6) while the mobile machine is travelling.

- 15 23. Lifting and tilting mechanism according to claim 22,
characterised in that

20 an electric signal corresponding to the speed of the mobile machine is conducted from a tachogenerator (126) of the mobile machine to the input (127) of the hydraulic control arrangement (125) to damp pitching oscillations of the working tool (6) while the mobile machine is travelling.